

1 TITLE: Compact Auxiliary Power Generator

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3 RELATED APPLICATIONS

4 This application is a continuation-in-part of U. S. Patent  
5 Application, Serial Number 09/945,186 which is a continuation-in-  
6 part of U. S. Patent Application Serial No. 09/603,725, now  
7 allowed.

8  
9 FIELD OF THE INVENTION

10 This invention relates to auxiliary power generators  
11 and, in particular, to a compact auxiliary power generator  
12 assembly coupled directly to a step box for use in mobile  
13 applications, such as large trucks.

14  
15 BACKGROUND OF THE INVENTION

16 Semi-truck tractor trailers frequently employ the use of an  
17 auxiliary generator to meet electrical requirements when the main  
18 engine is not running. Semi-truck tractor trailers having a  
19 "bunk" or "sleeper" are common and most interstate fuel stations  
20 permit the drivers of such vehicles to sleep in their cab. The  
21 passenger area of the truck may include convenience items such as  
22 a television, VCR, refrigerator, air conditioner, coffee maker,  
23 even a microwave oven. While such items may run on direct  
24 current provided by an engine mounted alternator, or even

1 alternating current by use of an inverter, the truck engine must  
2 be running. Idling laws now prohibit the running of the main  
3 engine for prolonged periods of time. However, the time and cost  
4 savings of keeping the driver near the vehicle while at rest are  
5 obvious and ancillary benefits include security as the operator  
6 does not leave the vehicle unattended. A problem with the use of  
7 auxiliary generators is directed to size, weight, and placement.  
8 The size of an auxiliary generator is critical for if the overall  
9 dimensions are too large, there will be insufficient areas on a  
10 truck for which to place the auxiliary generator. For instance,  
11 it is not possible to place an auxiliary engine within the  
12 existing main engine compartment. Placement of an auxiliary  
13 engine on the frame rails is a known alternative.

14 Generators also have a problem with vibration caused by  
15 misalignment. By mounting both units on a baseplate the  
16 misalignment of the belt drive between the engine and generator  
17 is prevented.

18 The Applicant is a well known assembler of engine/generators  
19 and has been awarded patents for compact generators including  
20 U.S. Patent Numbers 6,047,942 and 5,765,805 for disclosing the  
21 use of a combination engine/generator that is not only light in  
22 weight, but of a unique space saving configuration.

23 Thus what is found lacking in the art is a low profile  
24 generator set that minimizes space, weight, vibration and

1 includes an installation mount integrating the generator set with  
2 a vehicle.

#### 3 4 DESCRIPTION OF THE PRIOR ART

5 An integral engine generator set that may be used in this  
6 invention is disclosed in U.S. Patent No. 5,765,805 to G. W.  
7 Kennedy, the inventor here. The disclosure of this patent is  
8 incorporated herein by reference.

9 The integral engine generator set described in the patent  
10 utilizes a bracket interposed between the engine and generator  
11 for direct coupling of the components. The inspection plate of  
12 the engine is replaced by the bracket and the generator is bolted  
13 to the other side of the bracket. The bracket eliminates the  
14 need for a common baseplate and a belt tensioner. The engine and  
15 bracket may have isolation mounts for support or the engine,  
16 alone, may be mounted to the vehicle.

17 Base plates for motors are old and well known in the prior  
18 art as exemplified by U.S. Patent No. 2,662,988. Also, mounting  
19 brackets are conventional as shown by Credle, Jr. in U.S. Patent  
20 No. 4,441,684.

#### 21 22 SUMMARY OF THE INVENTION

23 The instant invention is a combination engine generator set  
24 combined with a support housing that is incorporated into the

1 design of the vehicle in which it is mounted.

2 The instant invention is an engine/generator assembly  
3 designed specifically for tractor and semi-trailer applications.  
4 The assembly is positionable within an enclosure by employing a  
5 horizontally disposed engine providing a low profile and securing  
6 the assembly within an enclosure to the chassis of the truck, in  
7 a similar manner as an auxiliary tool box.

8 An objective of this invention is to provide an  
9 engine/generator set with a very low profile fixed within an  
10 existing compartment of a vehicle.

11 Another objective of this invention is to provide an  
12 engine/generator set that is positionable within a conventional  
13 low profile step securable to a truck chassis.

14 Still another objective of this invention is to provide an  
15 engine/generator set with an air conditioner compressor having  
16 total dimensions less than the low profile enclosure.

17 Another objective of this invention is to provide a low  
18 profile mount for a engine generator set that minimizes vibration  
19 in the support vehicle.

20 Yet another objective of this invention is to provide a low  
21 profile mount which permits easy access to the components of the  
22 engine generator set.

23 Yet still another objective of this invention is to provide  
24 a generator enclosure that further operates as a step.

1           A further objective of this invention is to provide a base  
2 plate integrating the motor and generator and forming an integral  
3 construction with a storage box.

4           A further objective of this invention is to provide a  
5 engine, generator, base plate combination to be attached to a  
6 storage box.

7           Other objectives and advantages of this invention will  
8 become apparent from the following description taken in  
9 conjunction with the accompanying drawings wherein are set forth,  
10 by way of illustration and example, certain embodiments of this  
11 invention. The drawings constitute a part of this specification  
12 and include exemplary embodiments of the present invention and  
13 illustrate various objectives and features thereof.

14  
15 BRIEF DESCRIPTION OF THE FIGURES

16           Fig. 1 is a perspective, partially in section, of the low  
17 profile generator mount installed on a large truck;

18           Fig. 2 is a perspective of the step box with mounting  
19 structure;

20           Fig. 3 is a partial cross section and diagram of the engine  
21 generator set mounted on a base plate in a step box;

22           Fig. 4 is a perspective of another step box with  
23 alternative mounting for the engine generator set; and

24           Fig. 5 is a prospective of the rear of the truck step.

## DETAILED DESCRIPTION OF THE INVENTION

Now referring to Fig. 1 which shows an illustration of a large truck 1 having a chassis 3, or frame, in which an external fuel tank 5 is typically mounted between the cab 7 and the truck bed or trailer, not shown, attachable to the fifth wheel assembly 9. The prime mover engine has a cooling system which includes a fan 115 and a radiator 113. The size and height of the truck normally requires steps located beneath the door 11 to gain entry to the cab 7. In some truck designs, the steps are faired into the external fuel tanks for aesthetics and aerodynamics. In other designs the tanks are behind the doors of the cab and the steps are separate.

In the first embodiment, the generator set 10 of the instant invention is incorporated within a box 40 or step structure of the truck as shown in Fig. 3. The step structure 44 is made of metal attached to the truck frame 3, by bracket 112, and extends below the frame. The side walls 46 and 48 and the back wall 51 form an integral portion of the storage box 40 which is attached to the truck frame by a bracket 112 on the back wall 51 of the box 40. The bracket 112 may be attached to the frame by bolts, rivets, or other fastening devices and methods.

The step structure 44 has a lower step 42, extending horizontally closest to the ground, with a non-slip surface extending between side walls 46 and 48 at each end of the step.

1 The step 42 may be attached by the brackets 45 or made from a  
2 single piece of metal further forming a platform for mounting of  
3 the generator within the storage box, as shown in Fig. 5. The  
4 step 42 extends outwardly from the enclosure sufficiently to  
5 provide a safe footing.

6 The step 42 may be a solid planar metal sheet with a non-  
7 slip tread formed in the upper surface or an open mesh material  
8 43. In one embodiment, the step 42 is made with the base plate  
9 117 and the step 42 integral with the bottom of the box 40. The  
10 base plate 117, the step 42 and the bottom of the box 40 may be  
11 one piece or an assembly connected by welding, bolts or other  
12 conventional connectors.

13 A vertical cover 50 is rotatably attached to the brackets by  
14 a hinge 52 at the upper edge. The cover forms the front wall of  
15 the enclosure. The lower edge 54 of the cover 50 may have a  
16 latch mechanism to cooperate with the step 42 to releasably hold  
17 the cover 50 in place in the closed position. When closed, the  
18 cover forms the vertical riser between the lower step and the  
19 upper step. The height of the vertical riser is limited to the  
20 distance an average person can step, e.g. approximately 14 to 17  
21 inches. The hinged cover 50 provides access to the generator set  
22 while providing protection for both the machinery and the  
23 operators. The upper surface 58 of the cover 50 may form a  
24 second step if necessary to provide egress into the cab 11.

1 Another fixed vertical cover opposite the front wall forms the  
2 back wall 51 of the enclosure. The wall 51 has perforations 53  
3 for ventilation. In one embodiment (not shown), the hinge may be  
4 at the lower edge of the side wall and the latch near the upper  
5 step. The hinge may be omitted and the cover 50 may be  
6 completely removed, as shown in Fig. 2. In the preferred  
7 embodiment, the planar horizontal surface 58 of the enclosure is  
8 attached to the side walls 60 and 62 to form the upper step.

9 In the embodiment shown in Fig. 3, a crank case plate  
10 136 is constructed from steel or aluminum plate or other suitable  
11 material having a thickness of about 3/8 inch with a first side  
12 surface 138 securable to the engine 116 and a second side surface  
13 140 available for securing the engine and generator 142. The  
14 crank case plate 136 may be through-bolted to the engine and  
15 generator or otherwise fixed to provide a rigid engine/generator  
16 set. A set of isolation mounts 144 is secured to the plate 136  
17 providing a structure for mounting on the bottom wall inside the  
18 storage box 40.

19 The low profile generator set has the approximate dimensions  
20 of 28 inches length, 17 inches height and 16 inches deep. The  
21 preferred engine 100 is a one cylinder liquid cooled Kubota  
22 diesel engine turning a generator of 3.5 kilowatts capacity at  
23 120 volts and 30 amps. In another embodiment having a height  
24 approximately 14 inches, the engine radiator 113'' and cooling



1 fan 115' are located outside the enclosure and connected to the  
2 engine by the requisite hoses and wires, as shown in Fig. 5.  
3 The fan is located between the radiator and the enclosure wall.  
4 In this position, the fan serves the dual purpose of extracting  
5 heated air from the enclosure and providing air flow across the  
6 radiator. Preferably, the radiator and fan are attached to the  
7 perforated back wall 51 of the box 40 for protection of the  
8 components and safety considerations. As another alternative,  
9 the exterior mounted radiator and fan, shown in Fig. 5, are  
10 replaced and the cooling system of the engine generator set are  
11 connected by hoses 201, 202 to the radiator 113 of the prime  
12 mover engine. The prime mover fan motor is electrically  
13 connected to the generator set by cable 203 to provide power for  
14 the fan 115.

15 In Figure 3, there is shown a conventional diesel engine  
16 100, such as manufactured by the Kubota Corporation, having a  
17 horizontally disposed cylinder and an integral generator 142  
18 located on opposite sides of the crank case 116. The generator  
19 may be belt driven in which case there is an tensioner 120 for  
20 maintaining tension in belt 121 between engine 100 and generator  
21 142. Other drive forms, such as timing belt, chain or shaft may  
22 be used. This orientation is necessary to accommodate the  
23 internal space requirements existing in the box 40. In this  
24 installation, the piston reciprocates parallel to the step

1 surface.

2 The engine is self contained having a radiator 113', starter  
3 114, crank case 116, air cleaner 118, and fuel injections system.

4 The engine generator set has provision for an optional, add-  
5 on air conditioner compressor 130 for use with smaller prime  
6 mover engines. The air conditioner compressor 130 may be secured  
7 directly to the base plate 138 or the engine 100 or the generator  
8 or a combination. The compressor is powered by belt 131 or chain  
9 or shaft from the engine output. The over-all dimensions of the  
10 engine/generator set and compressor is such to fit within the  
11 enclosure, as shown in Fig. 3. The drive mechanism may be  
12 integrated with the generator drive or separate from it. The  
13 storage box 40 has apertures 132, shown in Fig. 5, for connecting  
14 the air conditioner compressor with the air conditioning system  
15 of the truck.

16 A base plate 138 supports both the engine 100 and the  
17 generator 142 in fixed relationship. The engine is directly  
18 connected to the base plate through an mounts 122. A mounting  
19 bracket 118 is mounted on the base plate 117 by isolation mounts  
20 144. Generator 142 has brackets 118 connected to the base plate  
21 138 by bolts 156. The engine and generator each may have  
22 additional isolation mounts connected to the base plate. The  
23 base plate 138 provides a platform supporting the engine  
24 generator set in fixed positions and serves as a structural

1 member for the box.

2 Figure 4 sets forth another embodiment wherein the generator  
3 set may be mounted in a box 70 having a removable top 72, a back  
4 side wall 71, opposite end walls 73, 75. The front side wall is  
5 omitted to show the interior. The lock 74 is shown as attached  
6 to the top 72 and cooperates with a lock mechanism on the front  
7 wall to secure the box 70. The box 70 is of a size of a  
8 conventional storage box found on trucks and may, or may not,  
9 operate as a step. The top 72 may be removed to gain access to  
10 the generator set and secured closed by a latch mechanism 74 to  
11 releasably connect the top to the remainder of the box. In both  
12 embodiments of the enclosure, there is adequate ventilation to  
13 permit dissipation of heat and engine air intake.

14 The box 70 has no bottom but each end wall 73, 75 terminates  
15 in a set of guide rails 76, 77 and 78, 79 extending along the  
16 length of each end wall and connected to the back side wall 71.  
17 The engine generator set, such as shown in Fig. 3, may be placed  
18 in the box 70 by sliding into the guide rails with the opposite  
19 lateral edges 151, 152 of the base plate 138 between the guide  
20 rails 76, 77 and 78, 79. The front wall of the box 70 is  
21 attached to the forward edge of the base plate such that a  
22 complete enclosure results from the assembly. The guide rails  
23 have locking devices to hold the base plate in place. As shown,  
24 the base plate has apertures 80 and 81. The guide rails 76 and

1 78 also have apertures 82 and 83. The apertures 80 and 81 will  
2 register with apertures 82 and 83, respectively, when the base  
3 plate is properly stowed. On each end wall, a reciprocating  
4 locking pin 84 is mounted above the apertures 82 and 83. In the  
5 locked position, the pins 84 will penetrate apertures 80,82 and  
6 81, 83 to prevent movement of the base plate. Of course other  
7 locking mechanisms may be used, such as detents and spring loaded  
8 pins or ball or end closures for the guide rails. Further, the  
9 side walls may have locking devices in addition to or in place of  
10 the mechanism on the end walls to hold the base plate in  
11 position. The front wall will also serve as a stop for the base  
12 plate when it is locked with the latch 74. While this embodiment  
13 is shown with a top opening box, it may be fabricated as a front  
14 opening box, as shown in Fig. 5.

15 It is to be understood that while a certain form of the  
16 invention is illustrated, it is not to be limited to the specific  
17 form or arrangement of parts herein described and shown. It will  
18 be apparent to those skilled in the art that various changes may  
19 be made without departing from the scope of the invention and the  
20 invention is not to be considered limited to what is shown and  
21 described in the specification and drawings.